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Superfund Record of Decision (EPA Region 2)
Bog Creek Farm, NJ. (Second Remedial Action)
June 1989

(U.S.) Environmental Protection Agency, Washington, DC

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Superfund Record of Decision:

Bog Creek Farm, NJ

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16. Abstract (Limit: 200 words) The Bog Creek Farm site is a 4-acre disposal area consisting of a man-made pond, bog, and trench in Howell Township, Monmouth County, New Jersey. The site is bordered to the north by Squankum Brook, to the west by two residences and a riding stable, and to the south and north by open fields. Between 1973 and 1974 organic solvents and paint residues were dumped around a trench in the eastern portion of the property, creating a highly contaminated soil area. Some chemicals migrated into a shallow underlying aquifer, creating a contaminant plume that discharged to the pond and bog along the northern border of the site and to the north branch of Squankum Brook. In late 1974 the property owner removed some waste from the disposal trench and covered the trench under direction from the Howell Township Health Department. A 1985 Record of Decision selected a first operable unit remedy that involved excavating the soil from the waste trench, pond, and bog areas and incinerating the soil onsite. This second operable unit focuses on remediating the contaminated ground water in the shallow aquifer and the contaminated brook sediment. The primary contaminants of concern affecting the sediment and ground water are VOCs including benzene, toluene and xylenes; and other organics including phenols. (See Attached Sheet)				
17. Document Analysis a. Descriptors Record of Decision - Bog Creek Farm, NJ Second Remedial Action - Final Contaminated Media: sediment, gw Key Contaminants: VOCs (benzene, toluene, xylenes), other organics (phenols) b. Identifiers/Open-Ended Terms c. COSATI Field/Group				
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EPA/ROD/R02-89/078
Bog Creek Farm, NJ
Second Remedial Action - Final

16. Abstract (Continued)

The selected remedy for this site includes ground water pumping and treatment using air stripping, hydrogen peroxide/ultra violet photolysis oxidation, carbon adsorption, and reinjection; excavation of brook sediment, followed by onsite incineration and onsite disposal; and stream bed restoration using clean sand or soil of similar consistency to the existing material. The estimated present worth cost for this remedial action is \$6,927,000, which includes annual O&M costs of \$663,000 for ten years of ground water treatment.

DECLARATION STATEMENT

RECORD OF DECISION

Bog Creek Farm

Site Name and Location

Bog Creek Farm, Howell Township, Monmouth County, New Jersey

Statement of Basis and Purpose

This decision document presents the selected remedial action for the Bog Creek Farm site, in Howell Township, New Jersey, developed in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act, as amended by the Superfund Amendments and Reauthorization Act, and, to the extent applicable, the National Contingency Plan. This decision is based on the administrative record for the site. The attached index identifies the items that comprise the administrative record upon which the selection of the remedial action is based.

The State of New Jersey has concurred with the selected remedy.

Assessment of the Site

Actual or threatened releases of hazardous substances from this site, if not addressed by implementing the response action selected in this Record of Decision, may present an imminent and substantial endangerment to public health, welfare, or the environment.

Description of the Selected Remedy

The remedial alternative presented in this document is a permanent solution for the contaminated groundwater plume at the site and the contaminated sediment in the north branch of Squankum Brook. This action is the second operable unit at the Bog Creek Farm site. The source of contamination was addressed in the first Record of Decision for the site, which was signed on September 30, 1985.



This, second operable unit, action consists of the following components:

- Groundwater extraction, treatment, and reinjection to restore the Upper Kirkwood aquifer to cleanup goals identified in the Decision Summary.
- Excavation and incineration of contaminated sediment from the north branch of Squankum Brook.

Declaration

The selected remedy is protective of human health and the environment, attains Federal and State requirements that are applicable or relevant and appropriate for this remedial action, and is cost-effective. This remedy satisfies the statutory preference for remedies that employ treatment as a principal element to reduce the toxicity, mobility, or volume of contaminated media and utilizes permanent solutions and alternative technologies to the maximum extent practicable.

June 28, 1988
Date

William J. Muszyński
William J. Muszyński
Acting Regional Administrator

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Decision Summary

Bog Creek Farm Supplemental Remedial Action

SITE LOCATION AND DESCRIPTION

The Bog Creek Farm site is located on Monmouth County Road 547 in Howell Township, Monmouth County, New Jersey. The north branch of Squankum Brook forms the northern border of the site (Figure 1). Two residences and a riding stable are located to the west of the contaminated area and open fields are situated to the east and south. Organic solvents and paint residues, as well as trash, were apparently dumped in and around a trench located in the eastern portion of the property, designated Block 46 Lot 29 on the Howell Township tax map.

The water table aquifer at the site is located in the Kirkwood geologic formation. Deeper aquifers are protected by layers of relatively impermeable material and an upward hydraulic gradient (water moves from the deeper aquifer, the Lower Kirkwood, to the shallow aquifer, the Upper Kirkwood). Residences in the vicinity of the site have private wells but are not threatened by site contamination. Surface water runoff and groundwater in the shallow aquifer discharge to the north branch of Squankum Brook. Squankum Brook enters the Manasquan River approximately one mile downstream from the site. A reservoir for public water supply is being built that will draw water from the Manasquan approximately three miles downstream from the site.

SITE HISTORY AND ENFORCEMENT ACTIVITIES

Dumping at the site is believed to have occurred in 1973 and 1974. Chemical waste dispersed through the sandy soil underlying the site creating an area of highly contaminated soil. Some chemicals also migrated in the groundwater of the shallow aquifer, creating a contaminant plume, and discharged to a pond and bog along the northern border of the site and to the north branch of Squankum Brook.

Late in 1974, the property owner removed some waste from the disposal trenches and covered the trenches under direction from the Howell Township Health Department. Over the next several

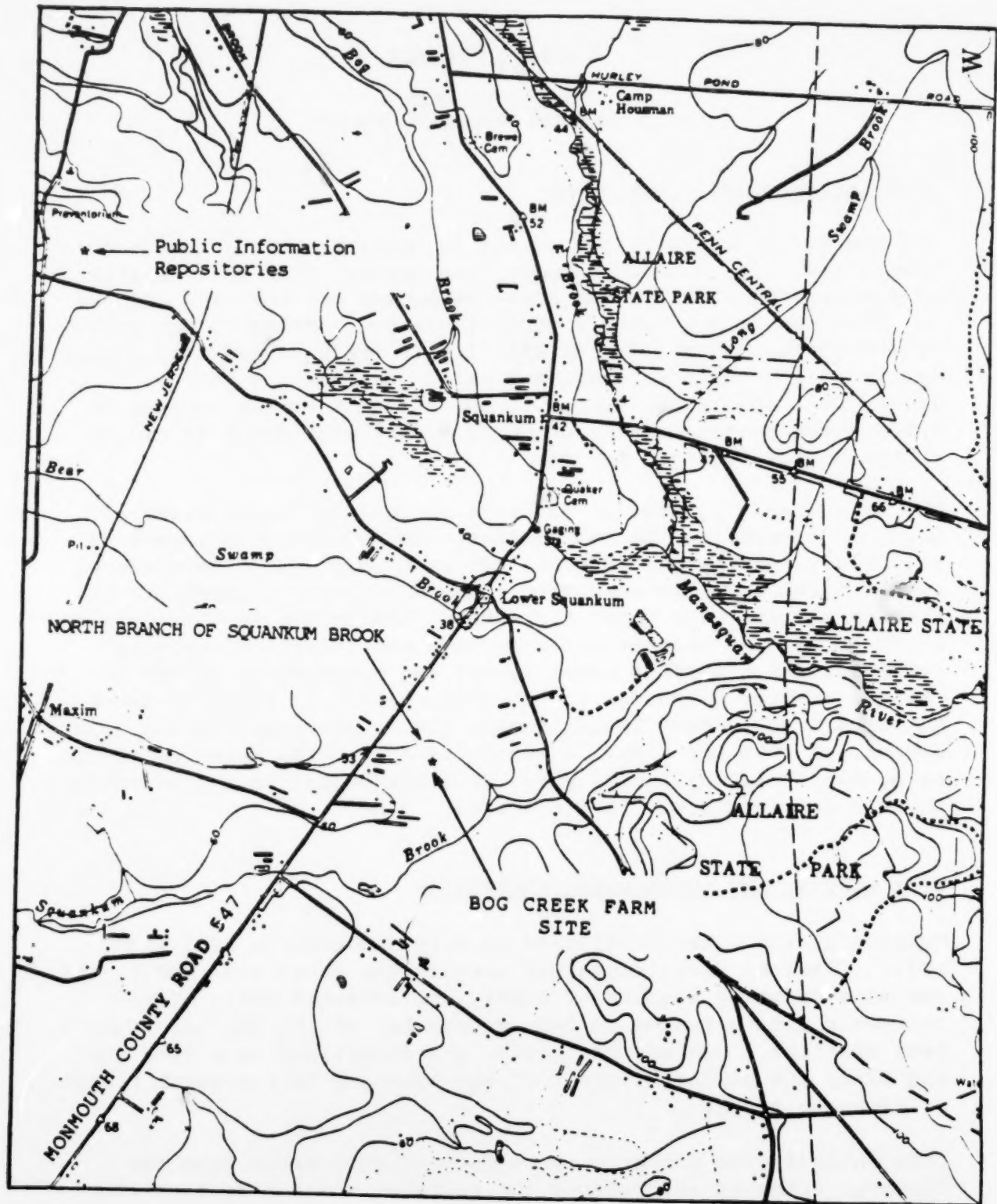


FIGURE 1

**BOG CREEK FARM
HOWELL TOWNSHIP
MONMOUTH COUNTY NEW JERSEY**

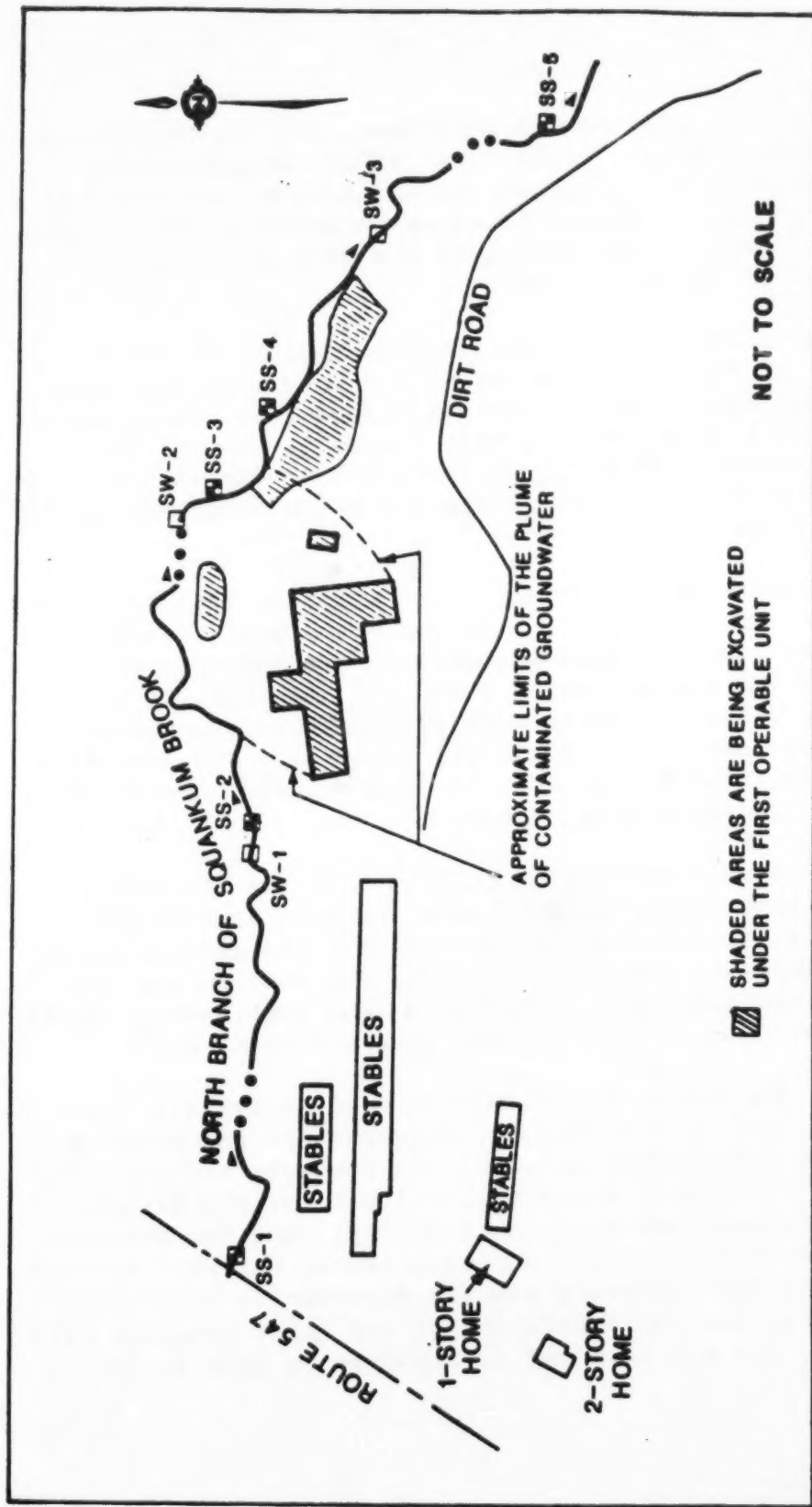
years, the Howell Township Health Department and the New Jersey Department of Environmental Protection (NJDEP) monitored the site. Bog Creek Farm was proposed for addition to the National Priorities List (NPL) of Superfund sites in December 1982. After a public comment period, the status of the site on the NPL was changed to final in September 1983.

The EPA began a remedial investigation and feasibility study (RI/FS) in 1984 to determine the nature and extent of contamination at Bog Creek Farm. This study determined that the greatest hazards at the site were the soil near the waste trench, which was highly contaminated primarily with volatile organic compounds, and the pond and the bog where migrating compounds tended to accumulate at the surface.

A Record of Decision (ROD) was signed on September 30, 1985 that selected a first operable unit remedy for these most hazardous areas. The first operable unit remedial action involves excavating soil from the waste trench, pond, and bog areas (see Figure 2) and incinerating it to destroy the organic contaminants. A remedial design was performed to develop and advertise specifications for this action and, in January 1989, a contractor was selected to implement this remedy.

The first operable unit ROD also specified that the EPA would perform an additional study to determine the most appropriate method to address the residual contamination. The investigation was focused on the soil and groundwater in the shallow aquifer. The results of that study are presented in the supplemental RI/FS reports and summarized in this (second operable unit) ROD.

In October 1983, the EPA sent information-request letters, pursuant to Section 3007 of the Resource Conservation and Recovery Act to Fred Barry (the former owner of the property and generator and transporter of waste to the site), A.I.C.O. of Old Bridge, New Jersey (the current owner of the property), and Sam Khoudary (a representative of A.I.C.O.). A notice letter was sent to Fred Barry in September 1985 offering him the opportunity to conduct the remedial design and implementation of the first operable unit remedial action. The EPA received no response to this letter.



SS-SEDIMENT SAMPLING LOCATION
SW-SURFACE WATER SAMPLING LOCATION

FIGURE 2
SITE LAYOUT
BOG CREEK FARM

COMMUNITY RELATIONS HISTORY

Community relations activities began with the first operable unit RI/FS in 1984. Public meetings were held to present the EPA's plans and findings, and the first operable unit RI/FS reports and the ROD were placed in public repositories. The public repositories are located at the Howell Township Municipal Building and the Howell Township Municipal Library. A formal public comment period was held in connection with the first operable unit ROD, and the comments and responses were summarized in the Responsiveness Summary section of that ROD.

The reports for the second operable unit were placed in the public repositories in 1989. These include the Remedial Investigation and toxicity study reports (February), the Feasibility Study report (April), and the Proposed Plan (May). The Proposed Plan summarizes the second operable unit RI/FS and identifies the EPA's preferred remedial alternative for the second operable unit. A formal public comment period opened on May 15, 1989, with the release of the Proposed Plan, and closed on June 16, 1989.

A public meeting was held on May 22, 1989. All comments received during the public comment period and at the public meeting are addressed in the Responsiveness Summary of this ROD. A transcript of the public meeting is also available in the administrative record for this site, which is available in the public information repositories and at the EPA's Region II office.

SCOPE OF THE OPERABLE UNIT

The EPA is addressing the remediation of the Bog Creek Farm site in two phases, or operable units. The first operable unit was the subject of the 1985 ROD. It addressed those chemicals that were dumped at the site that tend to adhere to soil particles and resist moving in the groundwater (the source areas) and the pond and bog, where chemicals accumulated at the surface. The supplemental RI/FS addressed those chemicals that tend to migrate in the groundwater, forming a contaminant plume.

SUMMARY OF SITE CHARACTERISTICS

The groundwater, soil, surface water, and brook sediment were sampled during the supplemental RI/FS for chemical analyses. In addition, toxicity tests were performed on samples from the north branch of Squankum Brook. Detailed results of this sampling are contained in the supplemental Remedial Investigation report and the toxicity study report. The data are summarized in the following sections.

Groundwater

The unconfined aquifer at the site is the Upper Kirkwood. The depth to the base of the Upper Kirkwood varies from approximately 10 to 30 feet below the surface across the site. The depth to the water table ranges from the surface (at the north branch of Squankum Brook) to approximately 10 feet below the surface.

The groundwater flows to the north and northeast, discharging to the north branch of Squankum Brook. The brook forms a groundwater barrier, preventing the flow of contaminants further north. The material below the Upper Kirkwood is relatively impermeable and forms a semi-confining layer at the top of the Lower Kirkwood. Water in the Lower Kirkwood is under pressure, so any leakage between the two Kirkwood units is upward. As a result, the contaminated plume at the site is limited to a small pocket of the Upper Kirkwood aquifer. Migration downward, into the Lower Kirkwood, and to the south and west is prevented by hydraulic gradients, and migration to the north is limited by the north branch of Squankum Brook.

Chemical analysis of groundwater samples from the Upper Kirkwood aquifer detected a variety of organic contaminants. The most prevalent compounds are toluene, xylene, 1,1,1-trichloroethane, benzene, 4-methyl-2-pentanone (methyl isobutyl ketone), benzoic acid, phenol, and 1,2-dichlorobenzene. The highest concentrations were found just north of the waste trench excavation area and are shown on Figure 3.

Soil

Soil borings were used to recover samples from four depths, as much as 22 feet below the surface. The locations of the borings

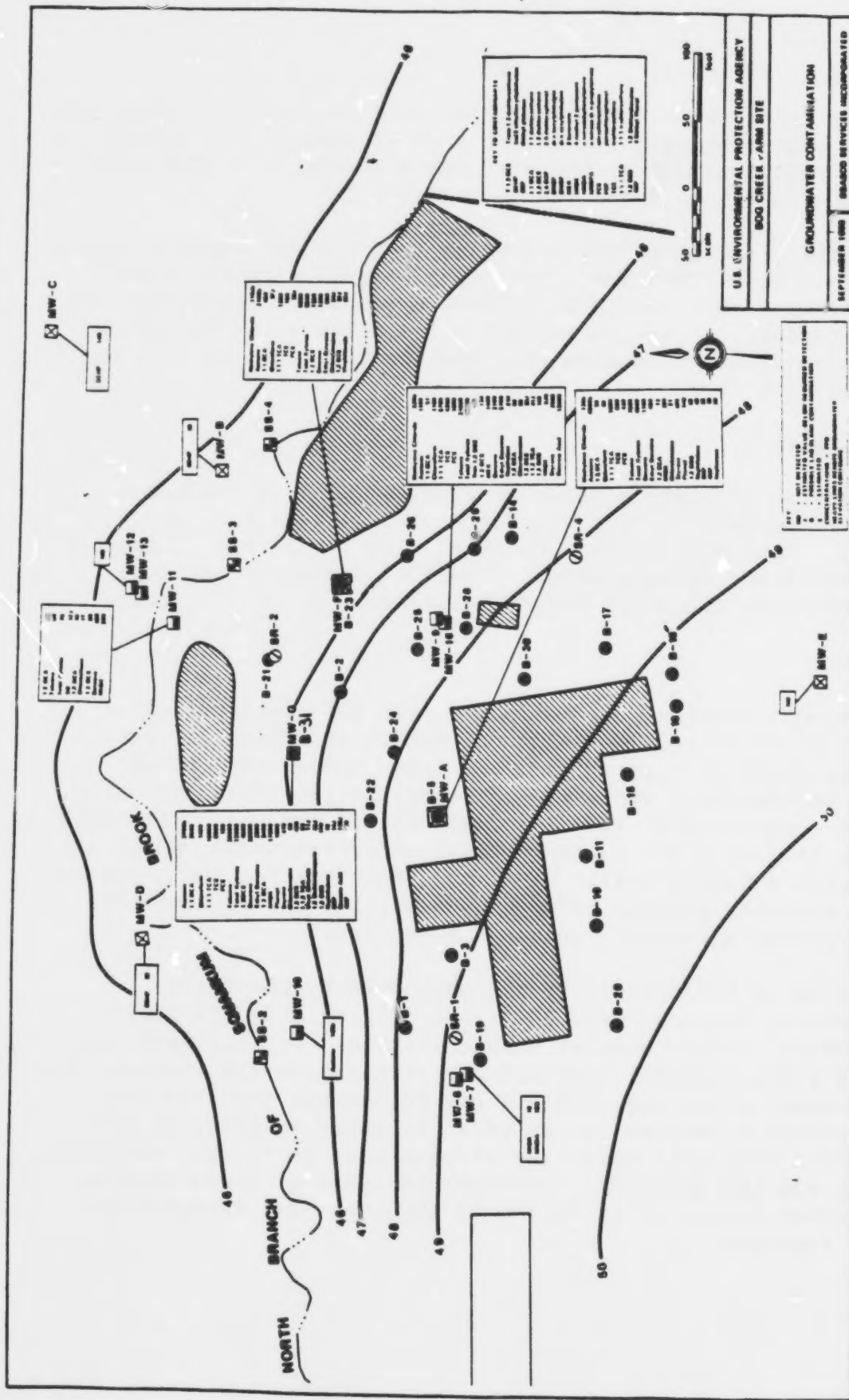


FIGURE 3
GROUNDWATER CONTAMINATION

are shown on Figure 3. These samples were used to determine the level of soil contamination in the area of concern for this operable unit (outside of the area being excavated). The chemicals found in the soil are listed in Table 1.

As with the groundwater contamination, the highest concentrations in the soil were found just north of the waste-disposal trench. Samples from 7 to 9 and 13 to 15 feet below the surface were the most contaminated. Few compounds, at relatively low concentrations, were found in samples from the top two feet and from the 20- to 22-foot depth.

Surface Water

Three samples of surface water were collected from the north branch of Squankum Brook. Sampling locations are shown on Figure 2. Chemical analysis revealed only low levels of organic chemicals in the surface water. These contaminants are most likely entering the brook through migration in the groundwater.

Sediment

Five sediment samples were collected from the north branch of Squankum Brook as part of the supplemental RI. Sampling locations are shown on Figure 2. The highest concentrations of organic contaminants were found at sampling locations SS-3 (just upstream from the bog) and SS-4 (adjacent to the bog). Although the data indicated low concentrations of contaminants, which did not present a public health risk, the EPA resampled the brook to perform toxicity studies to determine whether the contaminants were adversely affecting non-human receptors.

The results of the toxicity study performed by the EPA's Environmental Response Team (ERT) are available in the public repositories. Three samples were collected: S-1 was upstream from the waste disposal area but downstream from the stables, S-2 was adjacent to the bog, and S-3 was downstream from the bog. Unlike previous samples, these were collected in parts of the brook where the water moves the slowest and, therefore, sediment deposits are the greatest. Chemical analyses of these samples found higher levels of contaminants than had been detected in earlier samples.

Table 1

Soil Contaminants

All Concentrations in parts per billion (µg/kg)

<u>Compound</u>	<u>Concentration Range</u>	<u>Location of Highest Concentration</u>	<u>Mean</u>
Volatile...			
Methylene chloride	ND - 3300	B-3 (7-9')	376
Acetone	ND - 21,000	B-2 (13-15')	2969
1,1-Dichloroethane	ND - 2200	B-31 (13-15')	30
Chloroform	ND - 570	B-31 (13-15')	11
1,1,1-Trichloroethane	ND - 5900	B-31 (13-15')	100
Trichloroethene	ND - 26,000	B-31 (13-15')	388
Tetrachloroethene	ND - 1800	B-3 (7-9')	66
Toluene	ND - 32,000	B-1 (7-9')	1244
Total xylenes	ND - 38,000	B-1 (7-9')	1594
trans-1,2-Dichloroethane	ND - 20	B-21 (13-15')	ND
2-Butanone	ND - 18,000	B-2 (13-15')	534
Benzene	ND - 10,000	B-31 (13-15')	212
Ethylbenzene	ND - 9700	B-1 (7-9')	196
1,2-Dichloroethane	ND - 1400	B-31 (13-15')	20
4-Methyl-2-pentanone	ND - 23,000	B-2 (13-15')	784
2-Hexanone	ND - 77	B-11 (7-9')	2
Chloromethane	ND		
Styrene	ND - 7100	B-1 (7-9')	191
Carbon disulfide	ND		
Carbon tetrachloride	ND		
1,1,2-Trichloroethane	ND		
Semivolatile...			
4-Methylphenol	ND - 723	B-11 (0-2')	10
Benzoic acid	ND - 1072	B-14 (7-9')	26
Naphthalene	ND - 6100	B-25 (7-9')	110
Methylnaphthalene	ND - 1200	B-25 (7-9')	27
di-n-Butyl phthalate	ND - 22,170	B-11 (0-2')	970
bis(2-Ethylhexyl) phthalate	ND - 5900	B-15 (0-2')	730
di-n-Octyl phthalate	ND - 290	B-3 (20-22')	4
Phenol	ND - 4000	B-25 (7-9')	116
1,2-Dichlorobenzene	ND - 3200	B-18 (7-9')	79
2-Methylphenol	ND - 300	B-25 (0-2')	9
Phenanthrene	ND - 150	B-29 (7-9')	2
Benzyl alcohol	ND - 1300	B-18 (7-9')	33
Fluoranthene	ND - 770	B-25 (0-2')	13
Pyrene	ND - 110	B-25 (13-15')	1
Isophorone	ND - 290	B-5 (13-15')	10
Anthracene	ND - 120	B-24 (13-15')	1
N-Nitrosodiphenylamine	ND - 2300	B-1 (7-9')	101
1,4-Dichlorobenzene	ND - 170	B-1 (7-9')	2
Benzyl butyl phthalate	ND - 580	B-1 (7-9')	34
Diethyl phthalate	ND - 210	B-3 (7-9')	8
Benzo(g,h,i)perylene	ND - 134	B-11 (13-15')	3
Hexachlorobutadiene	ND - 268	B-14 (7-9')	3
Hexachlorobenzene	ND		

The toxicity of the samples was measured by exposing two types of test organisms to the contaminants. Daphnia magna (water flea) and Pimephales promelas (fathead minnow) were the two test organisms used. The fathead minnow showed no significant effect during the bioassay. However, the Daphnia showed higher toxicity for the sample from station S-2 as compared to the upstream and downstream samples.

SUMMARY OF REMEDIAL OBJECTIVES

The EPA, in consultation with the NJDEP, developed remedial action objectives for the second operable unit. The remedial objectives are based on the results of the public health risk assessment, the environmental impacts reflected in the chemical data and the toxicity study, and a consideration of the applicable or relevant and appropriate requirements of other Federal and State environmental and public health laws. The remedial objectives were used to guide the development and evaluation of remedial alternatives in the supplemental FS. This section of the ROD summarizes the development of the remedial objectives.

The soil and groundwater that make up the shallow aquifer at the site were considered as a unit. Public health risks from this unit are limited because the contaminated material remaining after the implementation of the first operable unit will be below the surface and the migration of contaminants in the aquifer is limited by the groundwater flow pattern to a small pocket of contamination. The only exposure scenario evaluated in the risk assessment that indicated significant health threats involved the construction of a house with a ten-foot deep basement in the contaminated area. This scenario assumed that all of the volatile contaminants had the carcinogenic potency of benzene and that a significant amount of these volatile organic compounds would leak into the basement. Based on the limited public health threat and the rate at which contaminants appear to be leaving the soil (comparing the 1987 and 1984 data), the EPA and the NJDEP decided it was not necessary to perform a remedial action for the soil.

The groundwater is highly contaminated; however, there is no human exposure to contaminants since there are no wells within the plume and, as described previously, the plume is hydraulically contained. The contaminated groundwater is, however,

discharging to the north branch of Squankum Brook, where it is partly responsible for the environmental degradation apparent from the toxicity study. For these reasons, the EPA and the NJDEP chose a remedial objective for the groundwater based on the protection of the north branch of Squankum Brook rather than human consumption of the groundwater. The quantitative remedial objectives, or cleanup goals, for groundwater are presented in Table 2.

The cleanup goals are derived from the limits that would be allowed for a discharge to the north branch of Squankum Brook at the site under a New Jersey Pollution Discharge Elimination System (NJPDDES) permit. Although the Kirkwood Aquifer has been designated a Class IIA aquifer (current drinking-water source) under the EPA's proposed Groundwater Classification System, the contaminant plume at the Bog Creek Farm site is an isolated pocket of this aquifer, separated from the portion of the aquifer used as a drinking-water source by hydraulic barriers described previously. Therefore, the more stringent requirements, maximum contaminant levels (MCLs), established by the Safe Drinking Water Act were not considered appropriate for the plume at Bog Creek Farm.

The toxicity study demonstrated that contamination in the brook sediments may have a detrimental impact on biota in the brook. A remedial objective was established to mitigate the hazard posed by the contamination in the brook sediments. Although the contaminated sediment will be removed to restore the environmental quality of the brook, there is no quantitative goal associated with this remedial objective, as the exact level of contamination that causes the environmental impact has not been determined and there is no regulatory standard to guide the cleanup of the brook sediment.

In summary, there are two remedial objectives (one for groundwater and one for sediments) for the second operable unit remedial action at Bog Creek Farm. The quantitative cleanup goals for the groundwater are presented in Table 2. In removing contaminated groundwater, much of the contamination detected in the saturated soil will also be removed. Much of the contamination in the unsaturated soil (above the water table) will be washed into the aquifer with infiltrating rain water and would be removed with the groundwater. Methods for addressing the con-

TABLE 2

GROUNDWATER CLEANUP GOALS

<u>Parameter (units)</u>	<u>Cleanup Goal</u>
Total Organic Carbon [TOC] (mg/l)	50 maximum
Biochemical Oxygen Demand - 5 day [BOD ₅] (mg/l)	15 maximum
Petroleum Hydrocarbons (mg/l)	10 average 15 maximum
pH (s.u.)	6.0 minimum 9.0 maximum
Copper, Total (μg/l)	8 maximum
Lead, Total (μg/l)	56 maximum
Zinc, Total (μg/l)	52 maximum
Benzene (μg/l)	5 maximum
Toluene (μg/l)	28 average 74 maximum
1,1,1-Trichloroethane (μg/l)	22 average 59 maximum
trans-1,2-Dichloroethene (μg/l)	25 average 66 maximum
Phenol (μg/l)	19 average 47 maximum
2,4-Dimethylphenol (μg/l)	19 average 47 maximum
Acute Toxicity [LC50] (%eff)	NMAT*

* No Measurable Acute Toxicity (NMAT) - less than 10% mortality in all concentrations including 100% effluent

taminated sediment in the north branch of Squankum Brook were also evaluated in the supplemental FS.

DESCRIPTION OF ALTERNATIVES

The supplemental feasibility study considered remedial alternatives to address two areas of concern at the site: contaminated groundwater and contaminated sediments in the north branch of Squankum Brook. A wide range of technologies was considered to address the remedial objectives for both of these areas. The technologies that were not eliminated from consideration during screening were assembled into remedial alternatives. These alternatives were also screened in accordance with §300.430(e) of the National Oil and Hazardous Substances Pollution Contingency Plan (NCP), 40 CFR 300.430(e), the regulations for implementing the Superfund program.

Groundwater

GW-1 No Action

Under this alternative, no active mitigation of the groundwater contamination would be implemented. The quality of the groundwater would be monitored through periodic sampling of existing monitoring wells.

Groundwater contaminants would continue to migrate to the north branch of Squankum Brook, eventually restoring the water table aquifer at the site. However, the discharge of contaminants to the brook appears to have an adverse impact on the biotic community in the brook. Therefore, this alternative does not achieve the remedial objective of protecting the north branch of Squankum Brook from the discharge of contaminated groundwater. Squankum Brook leads to the Manasquan River, where a water supply reservoir is currently under construction. However, chemical analyses of samples from the Manasquan River and the lower part of Squankum Brook indicate that the site is not currently affecting the quality of the water at the reservoir intake, which is now being built.

Annual monitoring would cost approximately \$19,800. The present worth of 30 years of monitoring and evaluation and presentation of the data would be approximately \$304,400.

Active Groundwater Remediation

Groundwater modeling performed during the supplemental feasibility study indicates that extracting 60 gallons per minute (gpm) of groundwater from three wells near the northern boundary of the site would prevent any of the contaminant plume from entering the brook and would pull in a minimal amount of clean water from the surroundings. Treated water would be reinjected upgradient of the plume to enhance the flushing of the contaminated aquifer. After flowing through the formation, the water would be intercepted by the extraction wells again. Systems using different pumping rates and extraction without reinjection were also evaluated in the technology screening section of the supplemental FS, but were not included in the detailed evaluation of alternatives because pumping at 60 gpm with reinjection provided for optimal remediation of the aquifer.

Several methods of treating the water were described in the supplemental FS and costs were developed for two promising systems. These two systems are described as alternatives GW-2 and GW-3 below. The technologies that were not incorporated into remedial alternatives were eliminated from consideration based on technical considerations, such as effectiveness, implementability, and cost.

Off-site treatment of the water at a Publicly-Owned Treatment Works (POTW) was eliminated from consideration primarily because the most expeditious groundwater restoration would be effected by reinjecting the treated water. Therefore, on-site treatment is preferred. Other negative factors associated with using a POTW are the distance that the water would have to be pumped to enter an existing sewage main and the likelihood that extensive pretreatment would be required.

On-site treatment methods other than those utilized in alternatives GW-2 and GW-3 were evaluated and found to be ineffective in treating the type of wastes present at Bog Creek Farm. Oxidation using ozone is one such treatment technology. A treatability study was performed on water from Bog Creek Farm to determine the

effectiveness of ozone in destroying the contaminants present at the site. The study indicated that ozone would not be effective. The supplemental FS report contains the complete screening of technologies.

In both active remediation alternatives (GW-2 and GW-3), the discharge of contaminated water to the north branch of Squankum Brook would be halted by altering the flow of groundwater in the Upper Kirkwood aquifer in the contaminated area, i.e. the contaminated water would be extracted from the aquifer by pumping it to the treatment system before it could reach the brook. The extraction system would remain in operation until the site-specific cleanup goals (Table 2) were attained. The remedy is expected to be completed within ten years.

GW-2 Extraction of Contaminated Groundwater, Three-Stage Treatment, and Reinjection

This remedial alternative would utilize a treatment option that incorporates air stripping, hydrogen peroxide/ultraviolet photolysis (H_2O_2 -UV) oxidation, and carbon adsorption. Air stripping would remove most of the volatile organic contaminants. The gas exhaust from the air stripper would pass through a vapor-phase carbon adsorption unit before the air was emitted to the atmosphere. The H_2O_2 -UV oxidation would remove those contaminants not removable by air stripping or carbon adsorption (particularly the highly soluble compounds, such as ketones). Finally, the liquid-phase carbon adsorption unit would remove the remaining organic contaminants. A schematic diagram, which shows each of the treatment steps and the interconnection of each step, is provided in Figure 4.

The concentration of dissolved chromium in groundwater samples from wells MW-B, MW-G, and MW-16 exceeded the maximum concentration for EP Toxicity (5 ppm), established under the Resource Conservation and Recovery Act. If the concentration of chromium in the groundwater entering the treatment system exceeds the EP Toxicity level, the water will be considered a hazardous waste. The need for an additional process step to remove metals, including chromium, will be evaluated in the remedial design.

The estimated cost of installing this system would be \$1,709,000. Annual operation and maintenance expenses would be approximately

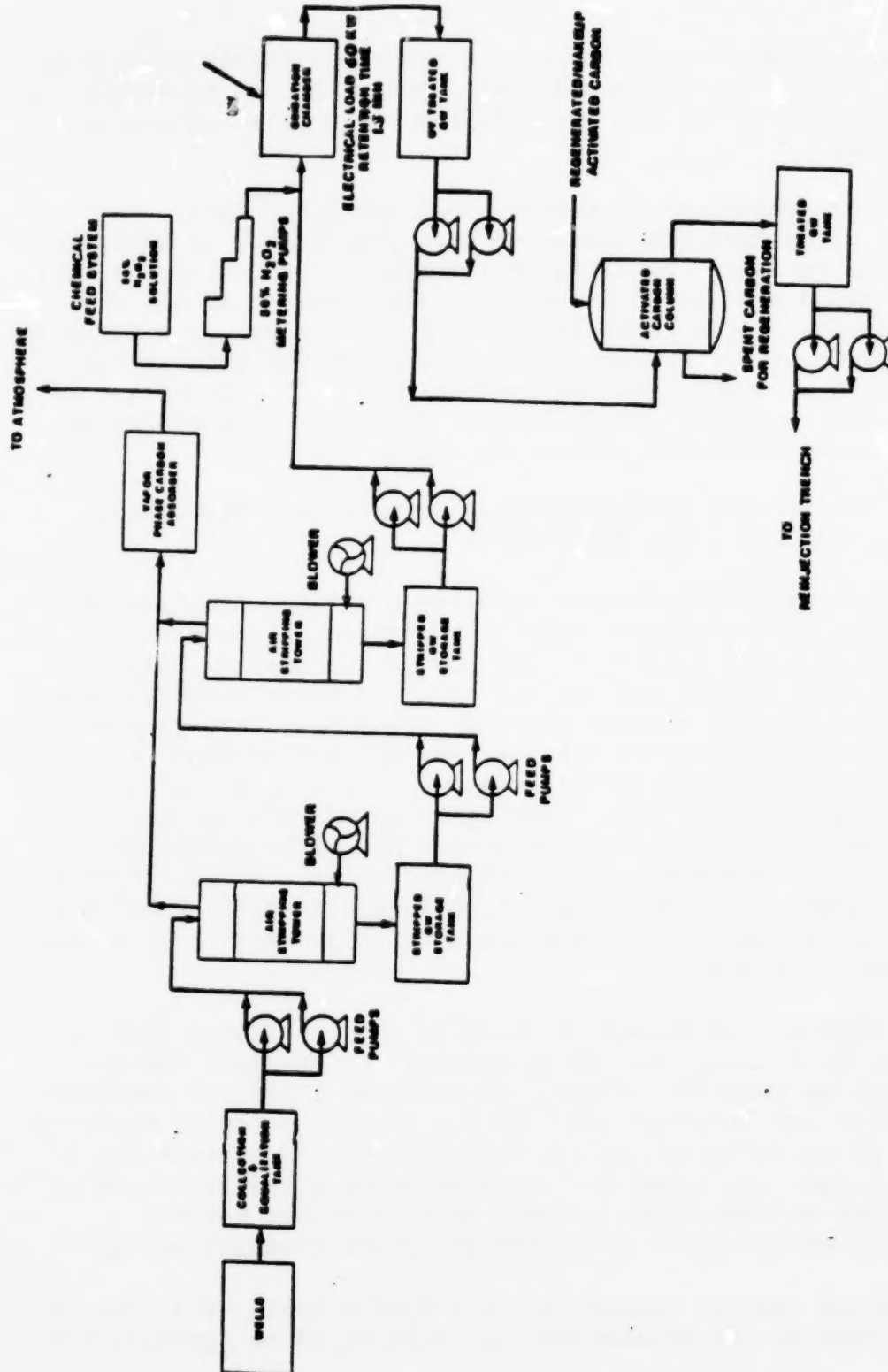


FIGURE 4
PROCESS FLOW DIAGRAM
ALTERNATIVE GW-2

PROCESS FLOW DIAGRAM ALTERNATIVE GW-2

\$663,000, resulting in an estimated present worth for this alternative, based on ten years of operation, of \$6,830,000.

GW-3 Extraction of Contaminated Groundwater, Two-Stage Treatment, and Reinjection

The system utilized for this remedial alternative is similar to the system described for alternative GW-2. However, it does not include the air stripper. Therefore, the vapor-phase carbon unit is not needed, but a larger H_2O_2 -UV oxidation unit is required. The capital cost is somewhat lower and the operation and maintenance cost is somewhat higher than for GW-2. A schematic diagram of the two-stage treatment system is provided in Figure 5.

The estimated cost of installing this system would be \$1,244,000. Annual operation and maintenance expenses would be approximately \$750,000, resulting in a present worth for this alternative, based on ten years of operation, of approximately \$7,040,000.

Sediment

In the summer of 1988, the EPA's Environmental Response Team (ERT) collected water and sediment samples from the north branch of Squankum Brook for chemical analysis as well as toxicity testing. Toxicity tests were performed using two test organisms: Daphnia magna (water-flea) and Pimephales promelas (fathead minnow). Elevated toxicity was reported for the Daphnia in the extract from one of the sediment samples. The EPA and the NJDEP decided to evaluate remedial alternatives to address the contaminated sediments because of their impact on the Squankum Brook habitat.

SB-1 No Action

The No Action alternative would allow the contaminated sediment to remain in place. This sediment is apparently hazardous to biota in the brook.

Warning signs would be installed along the north branch of Squankum Brook at an estimated cost of \$250. Annual monitoring and data reporting would cost approximately \$21,100. The present worth of this alternative would be approximately \$324,600.

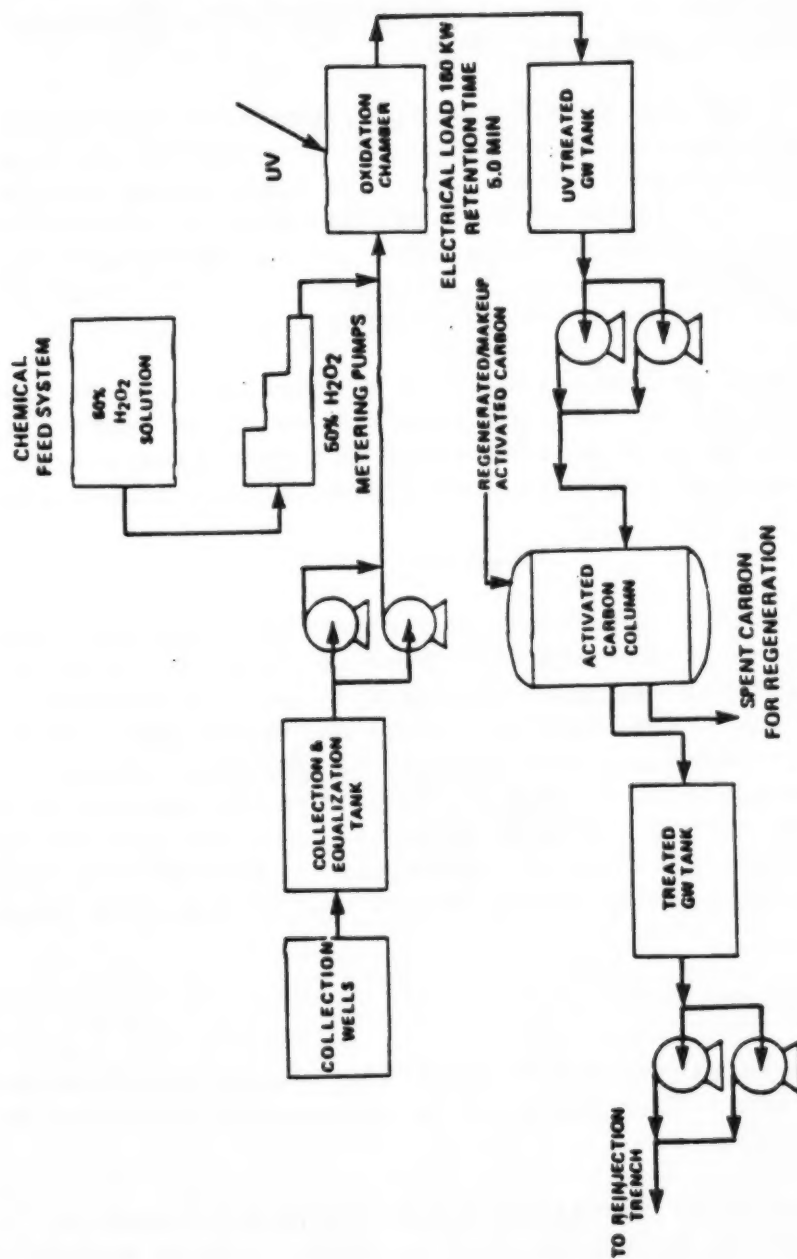


FIGURE 5

PROCESS FLOW DIAGRAM ALTERNATIVE GW-3

SB-2 Excavation and On-Site Incineration

This alternative would utilize the incinerator that will already be on the site as part of the first operable unit to treat the sediment. The estimated 90 cubic yards of contaminated sediment would be a minor addition to the 15,000 cubic yards of material being incinerated as part of the first operable unit.

The flow of surface water in the brook and groundwater that discharges to the brook from the north and south would be diverted during excavation to prevent contaminated sediment from being washed downstream. The stream bed would be excavated from just above sampling location S-2 to just downstream from sampling location S-3. After excavation, the exposed material would be sampled to determine the concentration of any remaining contaminants. The stream bed would be restored to its original contours using clean sand or soil of a similar consistency to the existing material. The cleaned sediments would be tested as specified in the contract for the first operable unit remedial action, and acceptably treated soil would be used as backfill in the waste-trench excavation.

The estimated cost of this alternative would be \$97,000. No operation and maintenance is required, so the present worth is equal to the capital cost.

SB-3 Excavation and Off-site Incineration

For off-site incineration, the sediment would need to be packed in drums at the site and removed to a permitted incinerator in trucks. Proper planning of the route and schedule of trucks should minimize any danger and inconvenience of trucking this material from the site. The same construction practices and limits of excavation that were described for alternative SB-2 would be used for this alternative.

The estimated cost of this alternative would be \$272,800. As with alternative SB-2, the present worth is the same as the capital cost.

The remedial alternatives are listed, along with their associated capital and operation and maintenance costs and present worths, in Table 3.

Table 3

Second Operable Unit
Summary of Remedial Alternatives and Estimated Costs

GROUNDWATER

<u>Alternative</u>		<u>Capital Cost</u>	<u>Annual Cost</u>	<u>Present Worth</u>
GW-1	No Action	\$0	\$19,800	\$304,400
GW-2	Extraction, 3-Stage Treat- ment, and Reinjection	1,709,000	663,000	6,830,000
GW-3	Extraction, 2-Stage Treat- ment, and Reinjection	1,244,000	750,000	7,040,000

SEDIMENT

<u>Alternative</u>		<u>Capital Cost</u>	<u>Annual Cost</u>	<u>Present Worth</u>
SB-1	No Action	\$250	\$21,100	\$324,600
SB-2	Excavation & On-site Incineration	97,000	0	97,000
SB-3	Excavation & Off-site Incineration	272,800	0	272,800

SUMMARY OF COMPARATIVE ANALYSIS OF ALTERNATIVES

The alternatives described above were evaluated in a detailed analysis that considered the nine criteria stipulated in the NCP. These are:

1. Overall protection of human health and the environment
2. Compliance with applicable or relevant and appropriate requirements (ARARs) of other Federal and State environmental and public health laws
3. Long-term effectiveness and permanence
4. Reduction of toxicity, mobility, or volume of contaminated media
5. Short-term effectiveness
6. Implementability
7. Cost
8. State acceptance
9. Community acceptance

The projected performance of each of the alternatives relative to the nine criteria mentioned above is presented below.

Groundwater

GW-1 No Action

This alternative would not provide any protection to the environment or public health. Although no public health risks were identified for the discharge of contaminated groundwater to the brook at current levels, this discharge may cause environmental degradation, such as stress to biota in the north branch of Squankum Brook.

The NJDEP and the EPA developed site-specific cleanup goals for the groundwater based on acceptable concentrations for the discharge of contaminants to the north branch of Squankum Brook. These criteria were adopted to provide protection to public health and the environment. Groundwater modeling performed during the supplemental FS indicates that the No Action alternative would not attain these cleanup goals for many years and the attenuation of contamination in the aquifer through natural migration of the plume would only move these contaminants to the brook. This alternative would not effectively reduce the impact of the site on the environment for the long- or short-term. It also would not reduce the toxicity, mobility, or volume of the contaminated water.

The monitoring program would be simple to implement and the cost of this alternative is very low compared to the cost of active remedial actions. The NJDEP expressed a preference for active restoration of the aquifer, as is noted in the following discussion, and the community appeared to favor the preferred alternative, as presented in the Proposed Plan and at the public meeting.

Active Groundwater Remediation

In both active remediation alternatives (GW-2 and GW-3), short-term protection would be achieved by immediately containing the plume. The discharge of contaminated water to the north branch of Squankum Brook would be halted by extracting the contaminated groundwater from the aquifer before it could reach the brook. The extraction system would remain in operation until the site-specific cleanup goals were attained. In the long term, the active remedies would be protective because the aquifer would be restored to the levels stipulated in the remedial objectives.

It is estimated that it will take ten years to restore the aquifer to the cleanup goals (Table 2). These goals were developed considering all Federal and State ARARs. The system would be operated in such a way as to comply with the operational requirements of Federal, State, and local laws, including requirements pertaining to construction in a floodplain and treatment levels for wastes similar to the groundwater.

The active remediation alternatives would immediately contain the plume and would eventually remove the contaminants through treatment. Either alternative would provide a permanent remedy that would effectively protect public health and the environment by reducing the toxicity and volume of contaminated groundwater. Both alternatives would remove contaminated water from the aquifer and render it non-hazardous through chemical treatment.

The pumping scheme has been developed to contain the entire contaminated plume of groundwater through the placement of the wells and the determination of the pumping rate. Although the restoration of the aquifer would take approximately ten years to complete, these remedial alternatives are both effective in containing the waste for the short term. Methods of expediting the restoration of the aquifer were explored in the supplemental FS, but these technologies were either not effective for the conditions at Bog Creek Farm or involved increasing the risks at the site. The two alternatives that were evaluated in detail balance short-term effectiveness and protectiveness with the goal of expeditiously achieving a permanent remedy.

The installation of the wells and the treatment system would involve only established, readily implementable technologies. Both the three-stage (GW-2) and two-stage (GW-3) treatment systems are fairly simple to operate, although the three-stage treatment process utilizes air stripping, which is a more proven technology for removing the volatile contaminants from the water. The restoration of the aquifer also depends on the successful extraction of the contaminants from the formation through extraction of the groundwater. The modeling performed during the supplemental feasibility study indicates that the pumping scheme is expected to effectively accomplish this goal.

The NJDEP was directly involved in the planning and performance of the supplemental RI/FS, and the EPA and the NJDEP worked together to establish the remedial objectives. State concurrence on the preferred remedy was obtained before the Proposed Plan was released. The State has indicated their acceptance of the remedy selected in this ROD in a letter to the Regional Administrator of EPA, Region II. This letter is contained in the Administrative Record for the Bog Creek Farm site.

The objective of the community relations activities was to inform the public about the work being performed at this site and to seek input from the public on the remedy. Issues raised at the public meeting and during the public comment period are addressed in the Responsiveness Summary section of this ROD.

The costs of the two active groundwater remedial action alternatives are similar, as shown in Table 3. The estimated capital cost of GW-2 is slightly higher, but the operation and maintenance expenses are less. As a result, the lifetime cost (present worth) of GW-2 is expected to be slightly less than for GW-3.

Sediment

SB-1 No Action

This alternative would allow the contaminated sediment to remain in the brook where it adversely affects the animal community. The No Action alternative would not offer any protection or remediation to the environment of the north branch of Squankum Brook, which has already been contaminated.

Although there are no ARARs to guide the remedial action for the sediment, the No Action alternative would fail to address the remedial objective for this medium. The NJDEP and the community have indicated a preference for active remediation of the brook as opposed to this alternative.

Active Sediment Remediation

The two excavation alternatives that were evaluated in detail differ in that alternative SB-2 would treat the sediment in the incinerator that will be on-site as part of the first operable unit remedial action, while SB-3 would remove the sediment to an off-site facility for permanent destruction of the contaminants. The protectiveness and long-term effectiveness of the two alternatives are the same, as the same construction techniques would be used to remove the same amount of contaminated material.

Both alternatives would provide protection of human health and the environment by removing the contaminated material from the brook. The stream bed would be replaced with sand of a similar

consistency to the material that is currently in place. The new stream bed material would eventually support a biotic community similar to that which was present before it was affected by the site.

Both of the excavation alternatives should provide effective, permanent remedies. The contaminated material would be removed from the brook and the organic contaminants would be destroyed through incineration, thereby reducing the toxicity of the material. In both alternatives, the contaminated material would be handled and treated in accordance with operating procedures established by the Resource Conservation and Recovery Act.

The on-site incinerator that would be utilized for alternative SB-2 is currently being approved for the first operable unit. The brook sediments that would be treated under alternative SB-2 are very similar to the material that will be treated under the first operable unit. Therefore, additional approvals will not be required for the additional material that would be incinerated as part of this alternative.

Short-term protection will be achieved by temporarily diverting the brook and groundwater flow into the brook during excavation to allow dry excavation and to ensure that contaminated sediment is not transported downstream. Excavation of the contaminated sediment would involve only established construction practices and diversion of the small brook should be accomplished easily. Both incineration options are also readily implementable.

Alternative SB-2 is the least expensive alternative for the brook sediment because the incinerator will already be present and operating at the site. The State and the community have indicated their acceptance of on-site incineration (alternative SB-2) in their acceptance of the preferred remedy.

THE SELECTED REMEDY

The selected remedy incorporates alternative GW-2 (Groundwater Extraction, Three-Stage Treatment, and ReInjection) and alternative SB-2 (Sediment Excavation and On-site Incineration). This overall remedy will address the contaminants that have already reached the sediment in the brook as well as those that are still

in the subsurface formation at the site. The contaminants in the plume will be contained in the short term by the groundwater extraction system and will eventually be removed and treated by the system. The sediment removed from the brook will be incinerated to permanently remove and treat the contaminants.

The evaluation of the alternatives in the previous section discussed each of the alternatives relative to the criteria established in the Comprehensive Environmental Response, Compensation, and Liability Act of 1980, as amended, (CERCLA) and the NCP. The selected remedy will provide protection of public health and the environment. Site-specific groundwater cleanup goals (Table 2) were developed by the EPA and the NJDEP to protect the north branch of Squankum Brook, the surface water that receives the contaminated water from the aquifer at the site. These goals will also form the endpoint for the groundwater restoration.

The three-stage groundwater treatment in alternative GW-2 was selected as it offers more certain treatment than the process in GW-3. Treatability tests on groundwater from the site have shown that air stripping and carbon adsorption can effectively remove most of the contaminants present in the groundwater. The H_2O_2 -UV oxidation will provide treatment of those chemicals that might not be removed by air stripping or carbon adsorption and will also reduce the consumption of carbon by treating some contaminants before the water enters the carbon adsorption unit.

Groundwater modeling has indicated that extracting 60 gpm of water from three wells placed near the northern border of the site (Figure 6) will provide a cost-effective means of restoring the aquifer. The selected treatment system utilizes air stripping, H_2O_2 -UV chemical oxidation, and carbon adsorption to treat or remove the contaminants from the water. The treated water will be reinjected on site, upgradient of the waste-disposal area.

On-site incineration of the contaminated sediments was selected based on the presence of an incinerator at Bog Creek Farm as part of the first operable unit. Since the incinerator will already be mobilized to the site, this option will be less costly and easier to implement than off-site incineration.

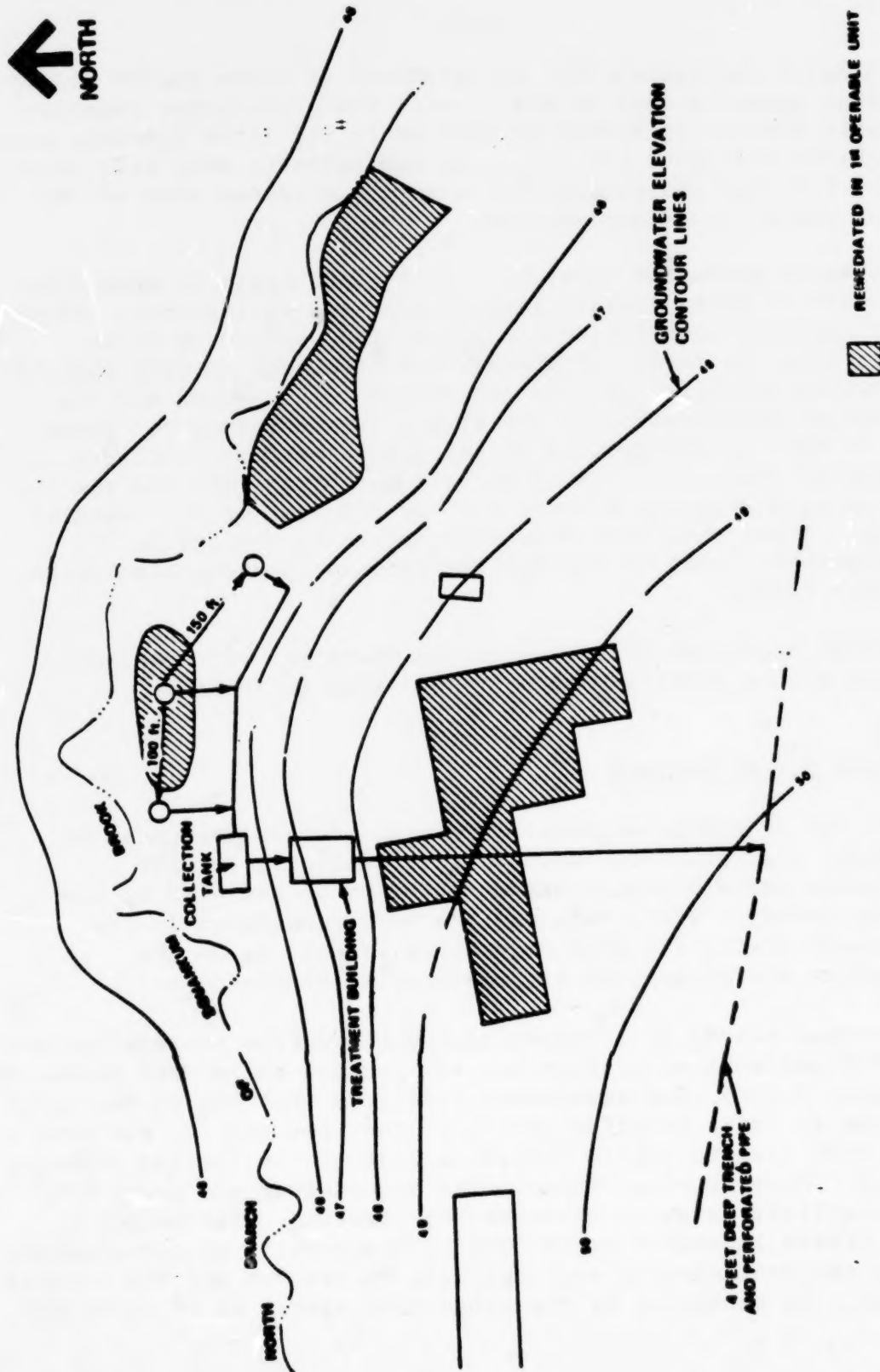


FIGURE 6
GROUNDWATER PUMPING AND
TREATMENT LAYOUT AT BOG CREEK FARM

The sediment excavation will be performed as close to the end of the first operable unit as practical. The groundwater remediation will then be initiated as soon after the first operable unit as possible to reduce the amount of contaminants that will reach the brook before the groundwater-extraction system cuts off the flow of contaminated groundwater.

The material below the excavation will be analyzed to determine the amount of contamination remaining in the environment. After the groundwater remediation has begun, the sediment will be sampled again to determine whether the discharge of contaminated groundwater occurring between the sediment excavation and the groundwater remediation had any effect on the sediment. These data, as well as the results of the groundwater monitoring during the aquifer restoration, will be reviewed by the EPA and the NJDEP to determine the success and the progress of the remedial actions. These data will also be supplied to the public periodically as part of the public awareness program associated with this remedy.

A detailed breakdown of the estimated costs for the principal elements of the selected remedy is provided in Table 4.

STATUTORY DETERMINATIONS

Section 121 of CERCLA stipulates certain factors that must be considered in evaluating remedial alternatives. It also establishes certain requirements that must be achieved by the selected remedy. These requirements were considered in the development of the remedial objectives as well as in the development and evaluation of the remedial alternatives.

The selected remedy will remove contaminants from the aquifer and the brook sediment to protect the environment and attain ARARs. The public health risk assessment indicated that the contaminants remaining at the site after the first operable unit do not pose a significant risk to public health because of the limited exposure pathways. However, the contaminated groundwater and brook sediment constitute existing environmental impacts. The selected remedy offers immediate protection from migration of contaminants in that the contaminated sediment will be removed and the groundwater will be contained by the extraction system as it is being

Table 4

Cost Summary for the Selected Remedy

	<u>Cost</u>
<u>Estimated Capital Costs</u>	
<u>Groundwater</u>	\$64,800
1. Support Facilities	133,600
2. Pumping & Collection System	94,900
3. Air Stripper	360,700
4. Vapor-Phase Carbon	127,400
5. H ₂ O ₂ -UV Oxidation	141,300
6. Liquid-Phase Carbon	147,800
7. Reinjection System	95,000
8. Building	<u>180,000</u>
<u>9. Utilities</u>	\$1,345,500
Groundwater Total Direct Construction Cost (TDCC)	269,100
Contingency (@ 20% of TDCC)	67,300
Engineering (@ 5% of TDCC)	<u>26,900</u>
Legal & Administrative (@ 2% of TDCC)	
Groundwater Total Capital Cost	\$1,708,800
 <u>Sediment</u>	
1. Groundwater Diversion Trenches	\$33,700
2. Sediment Excavation & Hauling (90 cy)	4,500
3. Incineration (90 cy)	34,500
4. Clean Soil (for Backfill)	1,800
5. Treated Sediment Disposal (On site)	900
6. Utilities	<u>1,000</u>
Sediment Total Direct Construction Cost (TDCC)	\$76,400
Contingency (@ 20% of TDCC)	15,300
Engineering (@ 5% of TDCC)	3,800
Legal & Administrative (@ 2% of TDCC)	<u>1,500</u>
Sediment Total Capital Cost	\$97,000

Table 4 (continued)

<u>Estimated Operation and Maintenance (O&M) Costs*</u>	<u>Annual Cost</u>
Groundwater	\$44,400
1. Performance Monitoring	3,000
2. Pumping & Collection System	39,100
3. Air Stripper	62,900
4. Vapor-Phase Carbon	95,200
5. H ₂ O ₂ -UV Oxidation	13,600
6. Liquid-Phase Carbon	2,600
7. Reinjection System	107,600
8. Maintenance (@ 8% of TDCC)	<u>263,000</u>
<u>9. Labor</u>	<u>\$631,400</u>
Subtotal Groundwater O&M Cost	<u>31,600</u>
Contingency (@ 5% of O&M Cost)	<u>\$663,000</u>
Total Groundwater O&M Cost	
Sediment	
No O&M is required	
<u>Net Present Worth and Discount Rate (10%)</u>	
Groundwater	\$6,830,000
Sediment	<u>97,000</u>
Total	\$6,927,000

*Based on ten years of groundwater treatment.

treated. Temporarily diverting the north branch of Squankum Brook and the groundwater that feeds the brook will prevent contaminated sediment from being washed downstream during the excavation, thereby addressing concerns relative to short-term risks.

The remedial objectives were developed based on the public health risk assessment and the assessment of environmental impacts while considering Federal and State ARARs. There are no ARARs to act as endpoints for the sediment remediation. However, the groundwater cleanup goals were established based on the State's requirements for protecting the north branch of Squankum Brook, the receptor affected by the contamination in the aquifer at the site.

Although the Kirkwood formation is used as a source of potable water, the contaminant plume is limited to a very small area at the site by physical factors, described previously. Therefore, it was determined that the Maximum Contaminant Levels established by the Safe Drinking Water Act are not applicable or relevant and appropriate for this action. Rather, the established limits for discharge to the north branch of Squankum Brook, the receptor of the contaminated water, are the relevant and appropriate standards for the cleanup of the groundwater.

The selected remedy will prevent any discharge of groundwater from the site to the north branch of Squankum Brook while the groundwater extraction system is in operation. At the same time the treatment system will restore the aquifer to the relevant and appropriate standards. The groundwater extraction and treatment system will remain in operation until these standards have been met.

The cleanup goals for groundwater are derived from the limits that would be allowed for a discharge to the north branch of Squankum Brook at the site under a New Jersey Pollution Discharge Elimination System (NJPDDES) permit. Although the Kirkwood Aquifer has been designated a Class IIA aquifer (current drinking-water source) under the EPA's proposed Groundwater Classification System, the contaminant plume at the Bog Creek Farm site is an isolated pocket of this aquifer, separated from the portion of the aquifer used as a drinking-water source by hydraulic barriers described in the Summary of Site Characteristics in this docu-

ment. Therefore, the more stringent requirements, maximum contaminant levels (MCLs), established by the Safe Drinking Water Act were not considered appropriate for the plume at Bog Creek Farm.

The selected remedy will be designed to comply with any operating standards that are ARARs. Treatment of contaminated water will comply with the requirements of the Resource Conservation and Recovery Act to the extent that the groundwater at the site is a hazardous waste. The sediments will be treated in the incinerator that is currently being approved for the first operable unit. ReInjection of the treated water will comply with the NJDEP's standards for reinjecting treated water. All operations that will occur in the floodplain of the north branch of Squankum Brook will be designed to minimize any impact on the brook and the associated wetlands and to prevent any disruption of the operation that might occur in the event of a flood.

The two alternatives that comprise the selected remedy (GW-2 and SB-2) are the most cost-effective means of achieving the remedial objectives. The sediment excavation and incineration will be coordinated with the ongoing remedial action and will only form a small addition to that project. The groundwater remedy uses the three-stage treatment that, in addition to being a more established treatment process, is slightly less expensive than the system described in alternative GW-3.

The selected remedy will provide a permanent remedy at the site, as treatment technologies (incineration and H_2O_2 -UV oxidation) will be used to destroy the contaminants. The activated carbon, which will be used to capture the contaminants removed from the water in the air stripper as well as in the liquid-phase carbon adsorption unit, will be regenerated off site. In attaining the remedial objectives, the selected remedy will provide a permanent solution that is protective of public health and the environment and that utilizes treatment to detoxify the contaminated media.

Responsiveness Summary

Bog Creek Farm

The Environmental Protection Agency held a public meeting at the Howell Township Municipal Building on May 22, 1989. The remedial investigation and feasibility study (RI/FS) and the Proposed Plan for the second operable unit, as well as the current status of the first operable unit, were presented at this meeting. A public comment period was held from May 15 to June 16, 1989 in connection with the release of the second operable unit RI/FS and Proposed Plan.

The following sections categorize the comments received into general issues. Many of the comments raised at the public meeting pertain to the first operable unit, particularly the operation of the on-site incinerator. As these comments are not related to the second operable unit, they are not incorporated in the ROD itself. However, they are presented and addressed in this Responsiveness Summary.

Manasquan River Reservoir

Several comments reflected the community's concern that the Manasquan River Reservoir, which is under construction, may be affected by contamination from Bog Creek Farm. The timing of the remedial action at Bog Creek relative to the opening of the water intake for the reservoir (scheduled for next Spring) was also a concern.

The surface water analysis performed by the EPA for the first operable unit RI/FS (1984 data) indicated that the contaminants entering the north branch of Squankum Brook were volatilized and diluted before reaching the Manasquan River and, therefore, would not affect the reservoir. The samples collected from the north branch of Squankum Brook as part of the current RI/FS support this conclusion. The EPA does not believe that the water diverted from the Manasquan River for the reservoir will have any detectable quantity of contaminants from the Bog Creek Farm site.

The reservoir was mentioned in the Proposed Plan to document that this issue had been considered in developing the preferred alternative. It was not the intention of the EPA to alarm the public with concern that the site has an adverse impact on the quality of the water that will be collected in the reservoir.

The EPA has been working with the New Jersey Water Supply Authority, the agency responsible for the Manasquan Water Supply System, regarding the cleanup of Superfund sites that potentially may affect the quality of water in the Manasquan River. The implementation of the first operable unit and the removal of contaminated sediment from the north branch of Squankum Brook should be completed well before the reservoir intake is opened. Although the aquifer restoration will not be completed for several years, the extraction, treatment, and reinjection system should be installed and effectively contain the plume by next summer. However, even without treatment the site has had no measurable effect on the water quality of the Manasquan River.

Cleanup Standards

The origin of the site-specific groundwater cleanup goals (Decision Summary, Table 2) was questioned. A particular issue was raised whether the EPA would abide by State standards that are more stringent than Federal standards.

The EPA worked closely with the New Jersey Department of Environmental Protection (NJDEP) in performing the supplemental RI/FS, including the selection of the remedial objectives and quantitative cleanup goals. The remedial objective for the aquifer restoration is to protect the north branch of Squankum Brook from the discharge of contaminated groundwater. Accordingly, the State's requirements for a point source discharge for the site were used for the groundwater cleanup goals.

The parameters used for the standards are the same ones that would be used for a discharge to this brook at the site. These numbers were derived considering the protection of the sensitive non-human receptors in the brook. The supplemental RI/FS indicates that there is not a human health threat at current levels.

Effect of the Site on Residential Wells

Two different issues were raised at the public meeting related to the effect of the site on residential wells. A nearby resident questioned whether the site was affecting any residential wells currently, and a member of the town council asked whether the

groundwater extraction system would affect the yield of water-supply wells.

As part of the 1985 RI/FS, five residential wells near the site were sampled. No contaminants from the site were detected in any of these wells. Subsequent hydrogeologic studies found that the contaminant plume is limited to a small portion of the shallow aquifer. The contaminants travel to the north from the waste-disposal area and are entirely intercepted by the north branch of Squankum Brook. No residential wells are located between the waste-disposal area and the brook, so none are threatened by the site.

The groundwater extraction system has been planned, based on groundwater modeling performed during the supplemental RI/FS, to contain the contaminated plume while withdrawing the minimal amount of clean water. At the same time, the treated water will be reinjected just upgradient from the waste-disposal area. Therefore, the groundwater extraction should have no effect on any water supply wells in the area.

Reinjection

It was noted that reinjection of treated water was not favored previously at other sites in this part of Monmouth County. The question arose why Bog Creek Farm was more suited to the use of this technology.

The same hydrogeologic features that have contained the plume also make this site amenable to the use of reinjection of the treated water. The contaminated area is fairly small, and the groundwater flow pattern will make it possible to capture the entire plume in the extraction system. Reinjecting the treated water will not force the plume to travel outside of the area that can be captured by the extraction system. Reinjection will expedite the restoration of the aquifer by replacing the contaminated water, which will be removed from the aquifer, with clean water from the treatment system, thereby allowing the extraction system to remove water without drawing the water table down below the main body of contamination.

Disposal of Ash

The EPA was asked whether ash from the incinerator would be removed from the site, and if so, what steps had been taken to ensure adequate disposal capacity off-site.

The remedial design for the first operable unit stipulated strict standards for the use of the ash as backfill in the excavation at the site. The incinerator should be able to easily remove the contaminants from the soil leaving clean material that can be returned to the site. If for any reason any ash does not meet the standards established, the contractor will have the option of subjecting it to additional treatment or removing it from the site for disposal in a landfill permitted to accept hazardous waste.

All of the treated soil will be used as backfill in the uplands portion of the site. The brook will be restored to its original grade using clean material imported to the site.

The construction contractor is responsible for the ultimate disposal of any material that must be removed from the site. The specifications for this action require the contractor to identify the disposal facility he intends to use. Any material that is removed from the site will be packed and transported as required by the appropriate regulations.

Future Use/Grading

Several comments addressed restrictions on the future use of the site. A related issue concerns the plan for regrading and revegetation of the site after the remedial action.

The contract for the first operable unit remedial action specifies the restoration of the site after the completion of construction. The site will be restored to its original grade with the exception that the sharp drop into the bog will be replaced with a gradual slope to the north branch of Squankum Brook. This change in slope was required by the ROD for the first operable unit to prevent contaminated groundwater from collecting in the bog area again. The pond, which was installed as an early remedial action, will be eliminated for the same reason. The site will be revegetated with native grasses.

During the restoration of the aquifer, some restrictions on the use of the site will be required to protect the pumps and the treatment system. In general, however, the use of the site will be determined by the owner of the property. After the completion of the second operable unit, the EPA does not foresee the need for any restrictions on the use of the site but may recommend that drinking-water wells not be installed in the former waste-disposal area.

Biological Survey

The EPA was asked whether a biological survey was performed to determine what species were present in the north branch of Squankum Brook and whether the site had any impact on activity or species diversity. A related question requested clarification of the results of the toxicity study.

The EPA did perform a biological survey of the north branch of Squankum Brook before the toxicity study was performed. This rough survey found no impact on the number of individuals or the diversity of species. The EPA's Biological Technical Assistance Group is preparing a summary of this survey. The summary will be sent to public repositories when it is available.

The toxicity study found elevated toxicity for one test organism (water flea) in one sample. The other test organism (fathead minnow) exhibited no elevated toxicity in any of the samples.

Long-Term Monitoring

One question addressed the duration of long-term monitoring after the completion of the aquifer restoration.

The aquifer will be monitored as long as necessary to ensure that the groundwater cleanup goals have been achieved. Once this is accomplished, further monitoring of the aquifer will no longer be required.

Air Quality/Monitoring

Several comments reflected the public's concern about air quality during the first operable unit (excavation and incineration) and the second operable unit (water treatment). Specific questions addressed the level of emissions from the incinerator and the design of the monitoring program.

The incinerator, as well as the rest of the construction system that will be used to implement the first operable unit, has been designed to minimize emissions. The incinerator and the water treatment plant will both be carefully controlled and all vapors and dust will be treated using extensive air pollution control equipment. Emissions from the excavation itself are more difficult to control, but the size of the open excavation will be limited to minimize vapor and dust emissions, and the air immediately outside of the excavation will be monitored. Any emissions will be controlled by wetting the open face of the excavation or using other construction practices as necessary.

Air monitors will also be placed at the perimeter of the site to record the level of any emissions. Although the normal operation of the incinerator and air pollution control equipment should prevent the release of any hazardous material, the incinerator is equipped with many safeguards and automatic controls to respond to any disturbance of normal operations. Air monitoring data will be supplied to Township officials; coordination with local emergency management personnel is addressed as a separate issue below.

Construction will not begin at the site until the contractor has satisfied the EPA and NJDEP regulatory authorities that the incinerator will perform up to the standards established in the remedial design. Part of the approval process involved modeling the emissions of vapors and particulate matter from all sources at the site during the remedial action. In response to a request from Township officials, the EPA supplied a copy of this model to the public. After the equipment is installed at the site, it will be tested in a trial burn using known material. Operations will only begin after the results of the trial burn have been accepted by the EPA and the NJDEP.

Coordination with Local Emergency Management Agencies

The EPA was requested to coordinate all construction activities with local emergency management agencies, and to supply all monitoring results to the Township.

The EPA's construction contractor has already had some contact with the local emergency management agencies. The EPA intends to follow up with discussions with local officials and will prepare a plan to outline coordination of all parties in the result of an emergency at the site. In addition, the EPA will coordinate with local officials the routes and times used by any truck traffic to or from the site. The EPA will also establish a system for reporting monitoring information to the township and for notifying the township of any release of hazardous materials from the site.

On-Site Incineration

Several questions were related to the operation of the incinerator at the site. In particular, there were questions about the duration of the operation at the site and whether any waste would be brought from other sites to the incinerator at Bog Creek Farm.

A transportable incinerator will be brought to the Bog Creek Farm site for the sole purpose of implementing the remedial action at this site. No material will be brought to the site from other locations to be incinerated. The contractor has indicated that it will take approximately two to four months to incinerate the material at the site.

ADMINISTRATIVE RECORD INDEX

June 1989

Bog Creek Farm

Remedial Action Master Plan (RAMP), NUS Corporation, April 1983
Community Relations Plan, NUS Corporation, June 1983
RI/FS Work Plan, NUS Corporation, February 1984
Site Operations Plan, NUS Corporation
Remedial Investigation (RI), Volume 1, NUS Corp., August 1986
Remedial Investigation (RI), Volume 2, NUS Corp., August 1986
Feasibility Study (FS), NUS Corporation, August 1986
Feasibility Study Addendum, NUS Corporation, September 1986
Record of Decision (ROD), September 30, 1985
Remedial Design (RD) Work Plan, Ebasco Services, June 1987
Request For Proposal (RFP), U.S. Army Corps of Engineers,
August 1988
Supplemental RI/FS Work Plan, Ebasco Services, November 1986
Supplemental RI/FS and RD Field Operations Plan, Ebasco Services,
November 1986
Supplemental RI, Ebasco Services, February 1989
Toxicity Study, EPA Environmental Response Team, February 1989
Supplemental FS, Ebasco Services, April 1989
Proposed Plan, EPA, May 1989
Public Meeting Fact Sheet, EPA, May 1989
Public Notice, Asbury Park Press, May 18, 1989
Correspondence from Anthony Farro, NJDEP, to John Frisco, EPA,
February 2, 1989, re: Remedial Action Objectives

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SITE NAME, STATE	ROD SIGNATURE DATE
Region 1	
Pinette's Salvage Yard, ME	05/30/89
Sullivan's Ledge, MA	06/28/89
Region 2	
Bog Creek Farm, NJ	06/28/89
Ciba-Geigy, NJ	04/24/89
Clothier Disposal, NY	12/28/88
Glen Ridge Radium, NJ	06/30/89
Montclair/West Orange Radium, NJ	06/30/89
Region 3	
Bally Groundwater Contaminatio, PA	06/30/89
Croydon TCE Spill, PA	12/28/88
Hebelka Auto Salvage Yard, PA	03/31/89
Kimberton, PA	06/30/89
MW Manufacturing, PA	03/30/89
Publicker/Cuyahoga Wrecking, PA	06/30/89
Reeser's Landfill, PA	03/30/89
Strasburg Landfill, PA	06/30/89
Whitmoyer Laboratories, PA	06/30/89
Wildcat Landfill, DE	11/28/88
Region 4	
Aberdeen Pesticide/Fairway Six, NC	06/30/89
American Creosote Works, TN	12/21/88
Amnicola Dump, TN	03/30/89
Cape Fear Wood Preserving, NC	06/30/89
Celanese/Shelby Fibers, NC	03/28/89
Chemtronics, NC	04/26/89
Kassouf-Kimberling Battery, FL	03/31/89
Region 5	
Bower's Landfill, OH	03/31/89
Byron Salvage Yard, IL	06/30/89
Galesburg/Koppers, IL	06/30/89
Laskin/Poplar Oil, OH	06/30/89
MIDCO I, IN	06/30/89
MIDCO II, IN	06/30/89
Miami County Incinerator, OH	06/30/89
Ninth Avenue Dump, IN	06/30/89
Outboard Marine, IL	03/31/89
Wauconda Sand & Gravel, IL	03/31/89
Wausau Water Supply, WI	12/23/88
Wedzeb Enterprises, IN	06/30/89

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SITE NAME, STATE	ROD SIGNATURE DATE
Region 6	
Pesses Chemical, TX	12/28/88
Sheridan Disposal Services, TX	12/29/88
South Valley/Edmunds Street, NM	03/30/89
Region 7	
Findett, MO	12/28/89
Lawrence Todtz Farm, IA	11/04/88
Region 8	
Libby Ground Water, MT	12/30/88
Region 9	
Fairchild Semicond(S San Jose), CA	03/20/89
IBM (San Jose), CA	12/15/88
San Fernando Valley (Area 1), CA	06/30/89